McKinsey Global Institute

July 2014

China's digital transformation: The Internet's impact on productivity and growth

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China's digital transformation: The Internet's impact on productivity and growth

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From a consumer-oriented Internet …

632 million
Chinese Internet users in 2014

700 million
Active smart devices

~US$300 billion
2013 e-tailing sales

4.4%
Size of China's Internet economy as a share of 2013 GDP—higher than the United States or Germany

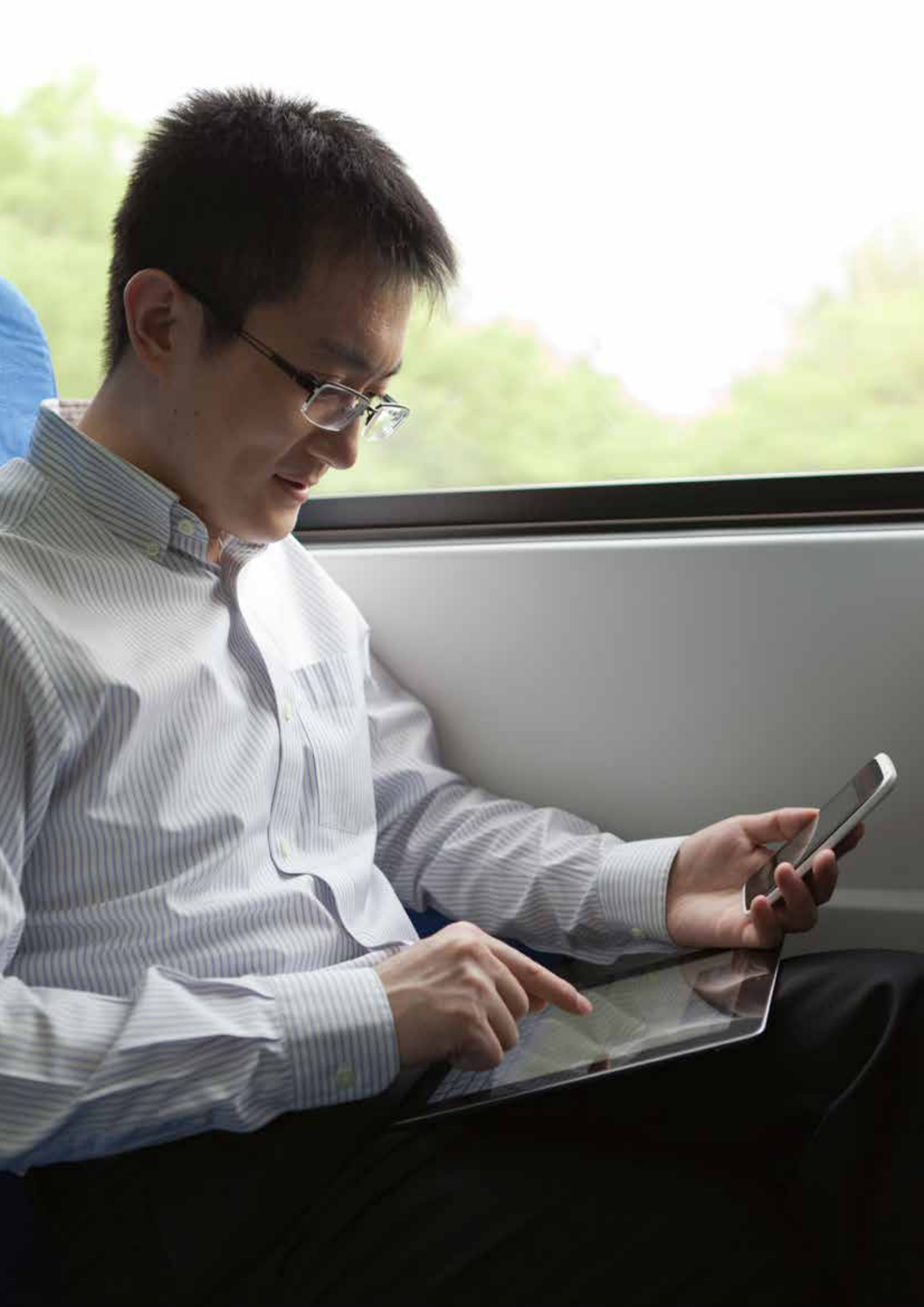
... to a more enterprise-driven Internet

7–22%
The Internet's contribution to the total GDP increase expected through 2025

Up to 22%
The Internet's contribution to China's productivity growth by 2025

RMB 610 billion
Potential annual savings in health-care expenditures by 2025

RMB 10 trillion
Annual GDP at stake by 2025, equivalent in size to Australia's current GDP



Executive summary

China is in the midst of a digital revolution. During the course of 2013, the number of active smart devices grew from 380 million to 700 million.[1] On Singles Day, the e-commerce marketplaces Taobao and Tmall posted more than RMB 36 billion (almost $6 billion) in sales in just 24 hours. Some five billion daily searches are made through Baidu, and hundreds of millions communicate via WeChat, Tencent's mobile messaging app. Now with 632 million users—and counting—the Internet is fundamentally altering the fabric of daily life in China.[2]

Until now, China's Internet has been largely consumer-focused (Exhibit E1). But that is about to change as the Internet penetrates more deeply across major sectors of the economy. As companies embrace Web technologies, their operations become more efficient, translating into productivity gains. While this process is likely to displace some workers from existing roles, the Internet also creates new markets for innovative products and services, increasing demand for workers with digital skills.

Exhibit E1

China's Internet has been consumer-driven rather than enterprise-driven

2013

		China	United States
Consumer side	**Internet usage**		
	▪ Users	632 million[2]	277 million
	▪ Penetration	46%	87%
	E-tailing		
	▪ Size	$295 billion	$270 billion
	▪ Share of retail	7–8%	6%
	E-commerce platforms	Taobao/Tmall	eBay
	▪ Items	800 million	550 million
	▪ Active buyers	231 million	128 million
	Smartphone penetration (share of installed base)	54%	69%
	Social networking among Internet users	60%	73%
Enterprise side	**Enterprise cloud adoption rate**	21%[3]	55–63%[4]
	SMEs Internet adoption ratio[1]	20–25%	72–85%

1 Positive survey responses for Internet use in procurement, sales, and marketing.
2 As of July 2014.
3 McKinsey China CIO survey, 2012.
4 Rates vary depending on types of cloud computing solutions.

SOURCE: Kable ICT Customer Insight survey, 2013; National Small Business Association survey, 2013; iResearch; China Internet Network Information Center; International Data Corporation; Strategy Analytics; US Census Bureau; Pew Research Center; National Small Business Association; McKinsey Global Institute analysis

1 *China mobile Internet 2013 overview*, Umeng Insight Report, March 2014.

2 China Internet Network Information Center, July 2014.

Depending on the speed and extent of industry adoption, the Internet could add 0.3 to 1.0 percentage points to China's GDP growth rate from 2013 to 2025. This could fuel some 7 to 22 percent of the incremental GDP growth expected through 2025—and by that point, it could translate into RMB 4 trillion to 14 trillion in annual GDP.

The Internet will not only be a source of much-needed momentum for China in the years ahead; it will also change the very nature of growth. The heavy capital investment and labor force expansion that fueled China's rise over the past two decades cannot be sustained indefinitely. The Internet, by contrast, can enable GDP growth that is based on productivity, innovation, and consumption. It also intensifies competition, allowing the most efficient enterprises to win out more quickly, and creates information transparency that improves investment decisions so that capital can be better allocated. It can spur skill upgrades within the workforce and create consumer surplus by lowering prices, making information more widely available, and enabling a multitude of new conveniences. The economy's shift toward the Internet will entail some risks and disruptions, but it can ultimately support China's goal of creating a more sustainable model for economic growth.

China is on the brink of a digital transformation that will enhance productivity and spur economic growth

The Internet provides a platform for millions of daily online transactions and communications that make a significant contribution to individual economies. MGI has developed the iGDP indicator to measure the size of a country's "Internet economy."[3] In 2010, China's Internet economy stood at 3.3 percent of its GDP, lagging behind most advanced economies. By 2013, its iGDP had reached 4.4 percent, moving China into the ranks of the global leaders (Exhibit E2).

China's Internet has already given rise to a dynamic technology sector, thriving social networks, and the world's largest e-tailing market. But the Web is just beginning to penetrate many Chinese businesses—and the most sweeping changes are yet to come. According to McKinsey's latest survey of CIOs, the typical Chinese company spends 2 percent of revenue on IT, far below the 4 percent international average, but respondents predict significant increases by 2015, indicating clear momentum.[4]

This report focuses on major new uses of the Internet that could penetrate more deeply in six sectors that collectively accounted for approximately one-quarter of Chinese GDP in 2013. Assuming that the Internet has a comparable impact on the rest of the economy, we project that these applications, combined with the finance sector's new capabilities to allocate capital more effectively, could enable 7 to 22 percent of the total increase in China's GDP projected from 2013 to 2025.[5]

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3 The iGDP indicator uses the expenditure method of calculating GDP. It totals all activities linked to the creation and use of Internet networks and services: consumption by individuals (including hardware, software, Internet access, and e-commerce), public expenditure (including infrastructure), business investment in Internet technologies, and the country's trade balance in Internet-related goods and services.

4 Dominic Barton, "Seizing China's new digital opportunity," *McKinsey on Business Technology*, number 29, spring 2013.

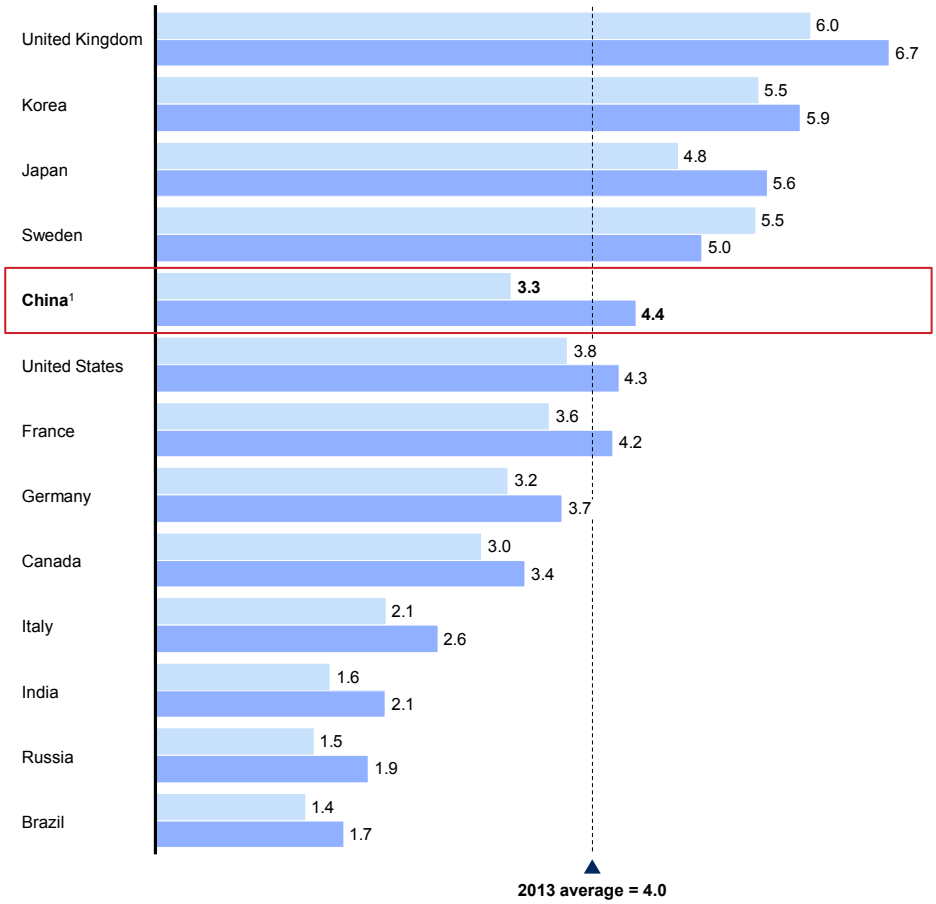
5 2025 GDP projections from IHS.

Exhibit E2

China's Internet economy is already larger than those of the United States, France, and Germany as a share of GDP

iGDP, 2013

Internet-related expenditures as % of respective country GDP



1 The C2C (consumer-to-consumer) e-tailing category in most countries primarily consists of secondary-market transactions by individuals and is negligible. But in China, it encompasses sales by small enterprises and microbusinesses without company registration. If C2C is included, China's iGDP would be 7 percent, higher than that of any G7 country.

SOURCE: McKinsey Global Institute analysis

The low end of these projections represents the current trajectory of adoption of these applications—that is, trends that are already unfolding today continue to take hold but existing constraints remain in place. The upper end assumes that a supportive policy framework is put in place quickly and that industries move aggressively to integrate these new Internet applications and build these new markets for digital products and services. The gap between these two numbers indicates the economic growth that China could generate if policy makers and business leaders successfully unlock the Internet's full potential. Some RMB 10 trillion in annual GDP will be at stake in 2025 alone (Exhibit E3).[6]

Perhaps even more important, the next wave of Internet development will help China shift toward a model of economic growth that is based on productivity, innovation, and consumption. The Internet is fueling the ongoing process of moving China's industry from less productive to more innovative and technologically advanced business models. Indeed, much of the Internet's impact

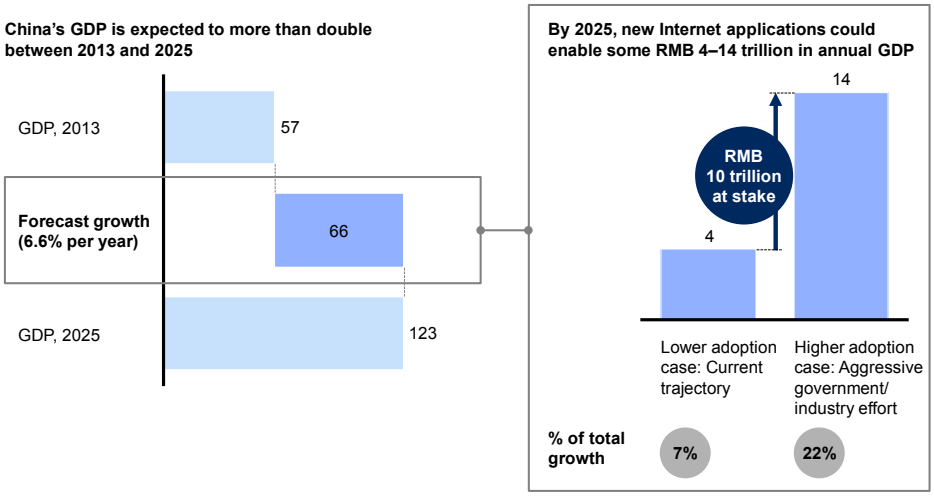
6 In 2013 terms.

will likely come in the form of productivity gains. As individual companies step up their adoption of Web technologies, they will streamline their operations, from product development and supply chain management to sales, marketing, and customer interactions. New applications of the Internet could enable 7 to 22 percent of China's labor productivity growth from 2013 to 2025.[7]

Exhibit E3

The speed and extent of Internet adoption will shape China's future economic growth

RMB trillion



NOTE: Numbers may not sum due to rounding.
SOURCE: McKinsey Global Institute analysis of growth projections from IHS

Our projections also consider the economy-wide spillover effect caused by a more competitive finance sector. Big data (to manage credit risks) and online channels (to reduce transaction costs) provide financial institutions with greater capabilities to increase lending to small and medium-sized enterprises—and they create favorable economics for doing so (see Box E1, "Unleashing the power of many: The Internet's impact on SMEs"). More efficient allocation of capital can potentially contribute RMB 450 billion to 1.5 trillion of the Internet-fueled GDP increase through 2025.[8]

Beyond its impact on GDP and productivity, the Internet will create convenience and generate substantial consumer surplus. Enhanced transparency and competition can lower prices while increasing the quality of goods—and the resulting savings becomes available for additional consumption. The Internet can also create broader benefits to society by connecting individuals with learning tools and huge stores of information and by enabling government at all levels to deliver public services more efficiently.

7 Given that the size of the working population is projected to decrease slightly, incremental GDP growth during this period can be almost entirely attributed to productivity growth (hence the similarity between the ranges of GDP and productivity outcomes).

8 In addition to reallocating capital from the large corporate sector to the SME sector, financial institutions will be better able to identify the most efficient companies *within* those two sectors. Although we did not assess this impact, it is substantial, and as a result, our estimated total impact is conservative.

Box E1. Unleashing the power of many: The Internet's impact on SMEs

Small and medium-sized enterprises (SMEs) contribute some 70 percent of China's GDP and are an important source of employment and innovation. Within the SME sector, however, China could generate even more dynamic growth from its small and micro businesses, which contribute 35 to 40 percent of GDP, compared with 52 percent in Germany, 54 percent in Mexico, and 67 percent in Italy.[1] The smallest enterprises typically lag behind larger companies in terms of labor productivity—and that gap is even larger in China than in other major economies.

China's small enterprises have thus far been hesitant in adopting the Internet, but going digital neutralizes some of the disadvantages they have been facing. The Internet provides a platform for entrepreneurs with new ideas to scale up rapidly and at low cost, and it allows them to collaborate with others along the value chain and within a broader ecosystem. Cloud computing reduces the need for hefty investment in IT systems, while online marketing can be purchased in small increments to target specific consumer segments. E-commerce marketplaces offer instant and direct access to consumers, along with support services such as payment and logistics. The Internet can even improve export capabilities: many Chinese SMEs are becoming "micro-multinationals" that sell to overseas customers on B2B marketplaces such as Alibaba or Global Sources, as well as on foreign platforms.

Limited access to capital is a common challenge for SMEs, and especially so for the smallest enterprises. Yet this picture is changing, as the Internet gives lenders new tools for evaluating credit risk and lowering transaction costs, and as private banks and Internet finance providers inject new competition into the financial services sector. Alibaba, for instance, provides microloans to its e-merchants, and JD.com offers supply chain financing to its e-merchants.

Technology adoption by small and micro businesses could have a disproportionate impact on raising China's labor productivity. The Internet lowers barriers to entry and heightens competitive intensity, thus accelerating the growth of the most innovative companies. This dynamic eventually improves the performance of the broader economy.

1 Small and medium-sized enterprises are non-subsidiary, independent firms that employ fewer than 250 employees in the European Union and fewer than 500 in the United States. In China, SMEs are generally defined as companies with fewer than 1,000 employees. China's small and micro businesses are those with fewer than 250 employees, which makes them comparable to SMEs elsewhere.

THE INTERNET MAY HAVE A NEUTRAL IMPACT ON OVERALL EMPLOYMENT, BUT SOME DISRUPTION IS INEVITABLE

The Internet is already reshaping China's labor market, and its impact is likely to grow over time. Despite the changes that will occur, the net impact on the total number of jobs from the Internet applications described in this report could be neutral to slightly positive. Additionally, these changes are taking place against a backdrop of strong economic growth and a workforce that will soon begin shrinking.

The most striking effect is likely to be on the composition of the labor market. Companies will need fewer workers to perform routine activities that can move online; some jobs will be lost, and roles will change. Simultaneously, the economy will need more workers with digital skills. Policy makers and business leaders will need to consider whether displaced workers have avenues for retraining and whether the education system is producing enough high-tech and specialized talent to meet the economy's future needs.

New Internet technologies are likely to automate some existing activities, but the resulting job losses can be offset by the increased wealth and consumption that the Internet generates. A previous MGI survey of more than 4,800 small and medium-sized enterprises found that as they adopted Internet technologies, 2.6 jobs were created for every job that was lost.[9]

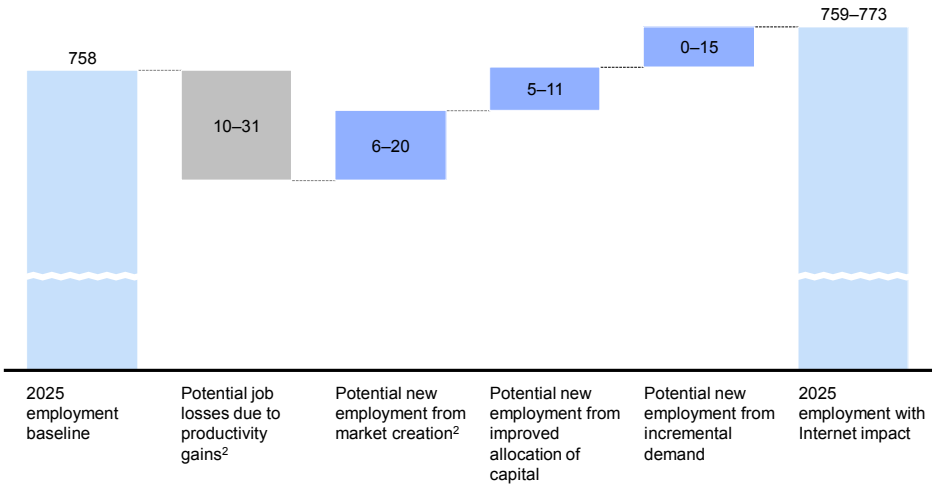
As competition intensifies and online price transparency puts pressure on margins, companies will have clear motivation to use the Internet to streamline their operations and become as efficient as possible. In the sectors we examined, Internet-related productivity gains from new applications could reduce employment by 1.3 to 4.0 percent, or approximately ten million to 31 million jobs, by 2025.

But the Internet is not just a tool for automation; it is also a force that rapidly expands markets. If the government and industry take the right steps to facilitate its development, the Internet could lead to the introduction of entirely new products and services, while allocating capital more efficiently and boosting demand across the economy. These factors could generate up to 46 million new jobs, including many positions requiring higher skills (Exhibit E4).

Exhibit E4

Job losses caused by productivity gains could be more than offset by the creation of up to an estimated 46 million new jobs

Million FTE[1]



1 Full-time equivalent. These estimates do not take into account the flexible and diverse working modes enabled by the Internet.
2 Extrapolated from detailed analysis of the employment changes likely to be caused by new Internet innovations in six representative sectors.
SOURCE: McKinsey Global Institute analysis

9 *Internet matters: The Net's sweeping impact on growth, jobs, and prosperity*, McKinsey Global Institute, May 2011. The surveyed businesses were in 13 countries, including China.

The Internet's transformative impact on six sectors

The Internet is already generating enormous economic value in China. To illustrate the transformations taking place across the economy, this research analyzes six sectors representing a mix of industry and services, of discrete and process manufacturing, and of corporate and semi-public sectors. Companies are beginning to revamp traditional business processes to achieve cost savings, and in some cases, new billion-dollar markets have taken shape virtually overnight.

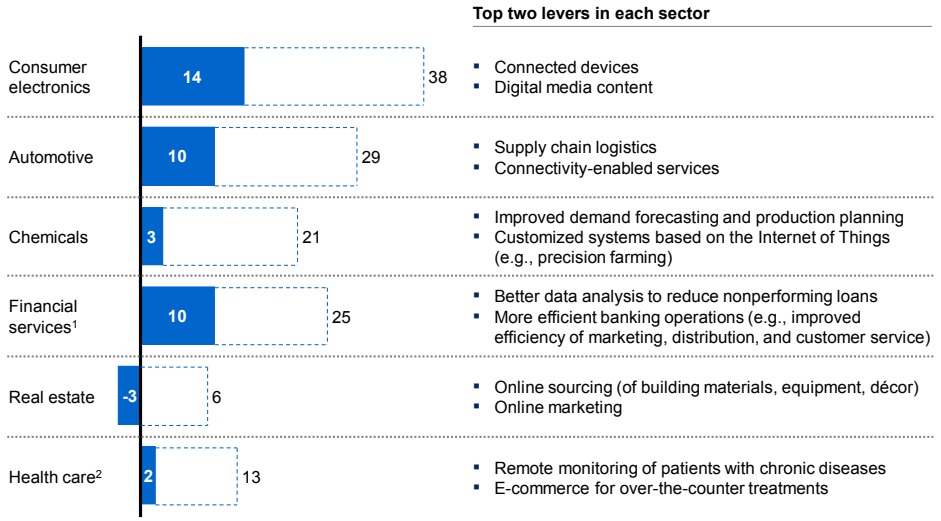
But at the same time, the Internet can unleash creative destruction. Since volatile industry dynamics will be at work, our research does not attempt to predict winners and losers. Instead, it examines major new Internet applications that are beginning to penetrate various sectors and takes a macroeconomic view, quantifying the value they can create throughout the economy. The results may not appear all at once, as companies will have to undertake considerable investment in the near term. But the impact will accelerate over time, and by 2025 the contribution to annual GDP will be substantial (Exhibit E5).

Exhibit E5

Adoption of new Internet applications in these sectors will have substantial economic impact

Contribution of new Internet applications to GDP growth, 2013–25

% of sector GDP growth



1 Does not include the effects of capital reallocation throughout the economy.
2 Refers to reduced health-care expenditures.
SOURCE: McKinsey Global Institute analysis

CONSUMER ELECTRONICS: CREATING NEW MARKETS FOR INNOVATIVE DIGITAL PRODUCTS

The Internet has unleashed a remarkable burst of innovation in consumer electronics, including connected devices such as smart home appliances and Internet TVs. Haier, for example, has developed the U-home solution, which connects appliances with a home's entertainment, security, and lighting systems. Chinese consumers have already demonstrated a huge appetite for digital movies, TV shows, music, games, and other media content. In 2013, some 70 percent of China's Internet users used online streaming, and about half used

mobile online streaming.[10] Consumer cloud services for data storage, file sharing, and other uses are another major area for growth.

The industry is also harnessing the Internet for productivity gains. Companies can now source from a wider range of suppliers to find the exact inputs they need at the best price, and marketing can be more targeted when it is moved online. E-commerce for consumer electronics posted a compound annual growth rate of 103 percent from 2009 to 2012, compared with only 9 percent for offline sales.[11] Some companies are even crowdsourcing product development to gain consumer insights: smartphone manufacturer Xiaomi has an online community of fans whose recommendations for product improvements are reflected in weekly software updates.

The Internet will continue to have a substantial impact on the consumer electronics sector, contributing some 14 to 38 percent of the overall growth expected through 2025.[12] It could also boost employment in the sector and its associated value chains by up to 7 percent.[13] Most of this growth stems from the creation of new markets for smart appliances, Internet TVs, digital media content, and cloud computing services, which all depend on broader Internet coverage and increased bandwidth.

AUTOMOTIVE: PAVING THE WAY FOR NEW SALES AND SERVICE OFFERINGS

The combination of slowing growth and excess capacity is increasing pressure on China's auto industry to boost productivity. The Internet will help Chinese automakers and other companies in the associated value chain meet these challenges and create new models for growth.

Leading manufacturers have been using real-time data to optimize inventory levels and transportation routes in their supply chains. In fact, McKinsey's work with China's automotive companies indicates that high performers turn over their inventory five times as fast as low performers. The Internet could also help automakers manage rising marketing costs as consumers go online to inform their purchase decisions. Škoda and Volkswagen are experimenting with selling cars on their own websites or on Tmall, while auto vertical websites like BitAuto and Autohome are growing rapidly.

Connectivity will open up a series of new markets and service opportunities. In addition to offering safety features and driving assistance, it can be used to deliver maintenance alerts and run remote diagnoses, saving servicing costs for dealerships as well as time for car owners. In China, GM's OnStar offers GPS

10 *33rd statistical report on Internet development in China*, China Internet Network Information Center, January 2014.

11 "Online retail series 2: Answering 4 key elec/appliance questions," Goldman Sachs, January 2014.

12 In all sector discussions, baseline projections are from IHS, while the Internet-enabled growth is estimated based on our research and extensive expert interviews. Productivity gains are estimated by assessing the affected cost base, adoption rate, and potential cost savings. New market creation is estimated by assessing the market penetration of new offerings, the ratio of incremental market growth vs. the existing market, and the value add of the new market.

13 In all sector discussions, employment estimates are for the sector itself and associated value chains only. These estimates do not include effects on cross-sector employment from capital reallocation and incremental demand.

and maintenance alerts, and BMW's ConnectedDrive provides remote control via smartphone. Mercedes-Benz recently launched the "Mercedes me" digital platform for providing service. Chinese automakers have been focusing on first-time buyers and necessarily know very little about them, but as customers trade up, connectivity could provide valuable insights that lead to future sales of vehicles and value-added services. The Internet of Things can also be used to track and even immobilize delinquent autos, making lenders and dealers more willing to extend auto loans to Chinese SME owners with insufficient credit histories.

China's used car market is still taking shape, but there is enormous room for growth. The used car market is expected to grow more quickly than new car sales, from three million vehicles sold annually today to more than 20 million by 2020.[14] E-commerce platforms such as Youxinpai and Cheyipai can help dealerships source quality used cars, help consumers find the right vehicle, and increase the transparency of information in each transaction—removing some of the major obstacles to market development today. Some leading sites allow easy comparison of used car listings, and momentum could continue to grow if independent services along the lines of Carfax and Kelley Blue Book in the United States evolve to provide vehicle histories as well as fair value estimates.

Major car rental and car service companies are already using online channels extensively to cut sales and marketing costs, while taxi and limo services are beginning to use the Internet to optimize fleet dispatching. Passengers can use mobile apps such as Didi and Kuadi to summon the nearest available taxi.

Internet technologies could fuel some 10 to 29 percent of the total GDP growth expected in the automotive sector by 2025, with 60 percent of this impact stemming from productivity gains. The Internet applications we identified are likely to have a roughly neutral effect on employment in the sector and its associated value chains, which could increase by up to 1.5 percent as a result of their impact. The employment opportunities created by new market expansion in used cars, connectivity-enabled services, and subprime loans for commercial vehicles could add up to 280,000 new jobs, more than enough to offset potential job losses of up to 200,000 from productivity gains in existing operations.

CHEMICALS: HELPING THE INDUSTRY MOVE UP THE VALUE CHAIN

China's chemical industry is in transition as companies try to succeed in low-profit commodity-based segments while developing more sophisticated products. At the same time, growing environmental concerns have led to tighter regulations and higher costs, increasing the need to optimize production processes. Internet technologies could help chemical makers tackle these issues.

The Internet can improve forecasting and production planning by supplying detailed, real-time data on everything from suppliers' inventory and shipments in transit to downstream customer demand. Although adoption of these tools is still at an early stage in China, the major producers have strong incentives to move ahead on this front. The Internet can also enhance R&D capabilities, keeping companies on the cutting edge of science and industry trends and enabling

14 Based on projections from the China Automobile Dealers Association and the State Information Center, as well as McKinsey analysis.

collaboration with customers and external experts. E-commerce has gained only limited traction in the sector, but it is likely to grow as chemical sales expand in small and mid-size cities. A few companies have their own online channels or work with third-party platforms such as Alibaba, HC360, and Guangzhou Chemical Exchange Center.

Companies can use the Internet of Things to begin offering integrated product solutions such as water treatment for industrial companies. Precision farming is another potential area for growth; sensors can collect and process real-time data about moisture and nutrient levels in the fields and automatically deliver fertilizer and treatments as needed.

The Internet could contribute anywhere from 3 to 21 percent of the total GDP growth expected in the chemical sector through 2025. The resulting productivity gains may lower employment in the sector and its associated value chains by up to 3 percent. New market growth could counter this effect, but many of these areas depend on the continued development of the Internet of Things. Technology standards could accelerate this process so that companies can leverage an industry-wide platform instead of developing their own proprietary systems. Traditionally, the chemical sector spends less on IT than other industries, especially in China. To capture the full potential of the Internet, chemical companies will need to increase their technology investment.

FINANCIAL SERVICES: SERVING NEW RETAIL AND BUSINESS SEGMENTS

Competition in financial services is intensifying as deregulation continues and Internet finance plays a larger role. These dynamics can erode margins, creating greater urgency for financial institutions to harness Web technologies to reduce costs and expand into new markets.

The Internet can provide a huge number of real-time data points that banks can analyze to reduce the risk of non-performing loans. Banks, securities firms, and insurance companies have built online channels for more efficient marketing and customer interactions. The Industrial and Commercial Bank of China estimates that an online transaction entails only one-seventh the cost of a transaction at a branch counter.[15] The combination of improved risk management and lower transaction costs will allow banks to serve more retail customers and SMEs.

Today Chinese consumers hold approximately 60 percent of their financial assets in deposits, but as the Internet reduces transaction costs, it brings down the minimum investment threshold for wealth management products. Online money market funds, discount brokerages, and third-party online marketplaces have begun to emerge. Internet payment platforms have provided a critical foundation for e-tailing and can also lead to increased consumption in offline retail.

The Internet is likely to contribute 10 to 25 percent of the GDP growth expected in financial services by 2025. Productivity gains may reduce employment within the sector itself by up to 5 percent, especially in sales and customer service. But greater use of Internet tools in finance will spur the creation of five million to 11 million jobs in other sectors throughout the economy as capital is allocated more efficiently.

15 ICBC annual report.

The regulatory framework governing financial services may need to be clarified to take new Web-enabled innovations into account. Internet finance increasingly links areas such as lending, payments, and investment that fall under different regulators, who will need to collaborate to provide predictable and consistent guidelines. The challenge for regulators will be to keep pace with change and strike a balance between encouraging innovation and mitigating risk. Regulators also need to establish clear guidelines for facilitating the data sharing needed to build a robust credit system while still protecting privacy.

REAL ESTATE: MOVING FROM BRICKS TO CLICKS

Chinese home buyers and renters increasingly search online to find their ideal home. E-commerce platforms such as SouFun.com offer listings and advertisements from developers, agents, and individual owners combined with search engines. The ability to identify serious buyers more quickly is streamlining real estate searches and transactions, reducing marketing and carrying costs for developers and agents. Local governments can now establish online platforms for land auctions, providing new transparency. In addition, Taobao, China's largest C2C e-tailing site, launched an auction platform for foreclosed properties in 2012.

E-commerce platforms enable real estate developers, contractors, and hotel chains to purchase construction materials, facilities, equipment, and interior decoration online. They can consolidate volume from smaller buyers, reducing purchasing costs by anywhere from 5 to 30 percent, and allow small suppliers to connect with customers.

The Internet is also creating new business lines. Property management companies can build online communities that connect residents of a particular development, for example. These can be used for regular administrative and maintenance work or to offer value-added services, although privacy and security concerns remain an issue.

More broadly, the Internet is reshaping demand within commercial real estate. E-tailing is decreasing the need for retail space and increasing demand for modern warehouse properties with state-of-the-art logistics; some malls are becoming more entertainment- and experience-oriented. New platforms that connect travelers with homeowners who will rent out accommodations could put pressure on the hotel industry, although this model has been slower to take hold in China than elsewhere.

The quantifiable impact of the Internet within real estate has a wide range. It could lead to a 3 percent decrease in sector GDP or contribute as much as 6 percent to growth by 2025. As the Internet creates productivity gains and reshapes demand, it could also reduce employment by up to 8 percent within the sector and associated value chains. Beyond that, it will cause value shifts as buyers and renters become more informed and greater transparency reduces price premiums based on information asymmetries.

HEALTH CARE: EXPANDING ACCESS WHILE LOWERING COSTS

China is engaged in an ambitious effort to reform its health-care system, which is coming under pressure as the population ages and chronic diseases become more prevalent. Hospital funding will be perhaps the most crucial determinant of whether this effort succeeds—and if it does, the Internet could be an important

tool for making the entire system more effective. Today many lower-tier hospitals, community health centers, and rural clinics lack technology systems. Even in top urban hospitals, information remains scattered. Shifting from paper records to an electronic health record system could dramatically improve China's public health management.

Structural imbalances represent one of the biggest challenges in China's health-care system. Eighty percent of resources are concentrated in urban areas, and patients prefer to crowd into the top hospitals for minor issues. Regional health information networks (RHINs) alleviate these problems by connecting leading hospitals with community health centers to coordinate referrals and treatment. RHINs are up and running in Shanghai and Beijing, and they are being set up in other major cities across the country. Telemedicine and remote monitoring are also improving access to resources by connecting rural patients with specialists hundreds of miles away. These concepts have advanced quickly in China, but to realize their full potential, incentives for hospitals and doctors will have to be aligned.

The Internet can also elevate the quality of care. Clinical decision support systems, for example, assist practitioners with diagnosis and provide alerts if there is a danger of an adverse drug reaction. Electronic health records and Web-enabled tracking systems can help with the implementation of standardized disease treatment protocols, while doctors can turn to learning portals (such as Ding Xiang Yuan) to stay on top of the latest research.

Consumers can now navigate the health-care system through platforms that rate and review hospitals and physicians. Because these tools make outcomes and patient satisfaction more transparent, they can increase pressure to improve performance. Online appointment systems could eliminate lengthy waits at top hospitals, while online consultancy platforms allow users to pose questions directly to physicians.

Pharmaceutical companies and medical device makers can use big data to expand research collaborations and streamline clinical trials. Electronic codes are being introduced to tighten supply chain supervision of drugs, eliminating counterfeits and preventing abuse. E-commerce could eventually expand the market for over-the-counter treatments, while online strategies could also improve marketing effectiveness.

The Internet can save some RMB 110 billion to 610 billion in annual health-care expenditures, which is 2 to 13 percent of the growth in health-care costs projected from 2013 to 2025.[16] Productivity gains may reduce employment in the sector and its associated value chains by up to 2 percent. On top of the direct savings, a more efficient system will bring enormous indirect benefits as it improves the quality of life and creates a healthier and more productive workforce.

Initiatives such as electronic health records and regional networks are progressing, but it will take government intervention to encourage hospitals, practitioners, pharmaceutical and device companies, and payers to adopt Web-

16 The health-care sector is excluded from calculations of the Internet's impact on overall GDP and employment, as its GDP is measured by total expenditure rather than the value of output. Any productivity-driven cost reductions in the sector, however beneficial, lower the sector's GDP.

based tools and systems. At the same time, privacy is paramount when it comes to personal medical information. New regulations will be needed to control risks, monitor the quality of emerging products and services, and guard against fraud and misleading information originating online.

Capturing the Internet's full economic potential depends on government action and industry adoption

The Internet could add 0.3 to 1.0 percentage points to China's GDP growth rate and enable 7 to 22 percent of incremental GDP growth through 2025.[17] How much of this potential China will actually capture depends on the government's ability to create a supportive policy environment, the willingness of companies to go digital, and the adaptability of workers.

CHINA'S GOVERNMENT FACES MULTIPLE CHALLENGES IN HARNESSING THE INTERNET FOR ECONOMIC GROWTH

Government entities at all levels now have an opportunity to increase their own effectiveness through the use of Web-based systems and tools. In their role as regulators, policy makers need to be fluent in the language of technology so they can participate in the flow of discussion with industry players and keep current with the latest innovations. The Internet's growth will require a policy framework that addresses the issues outlined below:

- **Enhancing privacy protection and data sharing.** A great deal of the Internet's potential for value creation stems from data sharing, which raises serious privacy concerns. In late 2012 China's government announced a preliminary set of rules regarding online privacy, but additional measures are needed to create strong penalties for violators and put sufficient resources into enforcement. A balanced set of regulations governing the kinds of information companies can share, the types of usage that are allowed, and the type of consumer consent that is required could remove constraints on big data adoption. The government can create significant momentum by making its own data sets publicly available.

- **Liberalizing markets to encourage new innovations.** In many cases, regulation will determine the degree to which companies can utilize the Internet. In financial services, the business lines that banks can move online will depend on regulations governing whether certain transactions have to be completed in person. Online platforms can develop the used car market, but regulations on cross-provincial transactions may need to be adjusted.

  One central issue to consider is "letting the market mechanism function."[18] Robust competition (both domestic and foreign) would accelerate productivity gains. A transparent market mechanism that allows for failures and resolutions will reinforce risk management among business owners. In addition, the Internet can create large network effects and a "winner takes all" dynamic.

17 The total growth potential was estimated by applying the ratio projected for the consumer electronics, automotive, chemical, financial services, and real estate sectors to industrial and service sectors across the entire economy.

18 *The decision on major issues concerning comprehensively deepening reform*, Third Plenary Session of 18th Central Committee of the Communist Party of China, November 2013.

The government may have to monitor how competition evolves to ensure that the broader economy benefits from maximum productivity gains. Balancing intellectual property protections and enforcement with the need to disseminate and combine new ideas will also be fundamental to unleashing innovation.

- **Developing workforce skills.** The Internet could significantly change the structure of employment. The government can ease this dislocation by collaborating with industry to ensure that training programs are available to help workers continually refresh their skills. China can also adapt school curricula to cultivate greater digital literacy and create a true education-to-employment pipeline. In fact, new digital education tools could accelerate China's ability to improve the quality of education across all regions at low cost.

- **Expanding Internet infrastructure and setting standards.** Household broadband penetration in China stood at only 39 percent in 2013, but the government aims to achieve 50 percent penetration and 32.5 percent 3G/LTE coverage by the end of 2015.[19] Building out networks is crucial to bringing more of the population online and facilitating industry adoption; cloud computing and big data applications in particular require sufficient bandwidth. Adopting international technology standards instead of unique domestic standards can also improve China's competitiveness and ability to export.

COMPANIES HAVE TO PREPARE FOR RAPID CHANGE AND INTENSIFYING COMPETITION

Transforming a traditional company into a digital business involves rethinking everything from company culture to strategy, operations, organization, and partnerships. Below are some of the major considerations for business leaders:

- **Cultivating a "customer first" mentality.** The Internet gives customers new power to take their business elsewhere with the click of a mouse—so their needs have to guide every aspect of a company's operations. Consumers expect companies to deliver a seamless, convenient, and personalized user experience. Rather than focusing on mass production, companies can now use the Web to choose from a wider range of suppliers, glean customer insights, and produce a more complex portfolio of products that is better targeted to what consumers want. Chinese consumers are avid users of social networks, so adding social connectivity and building online communities can be powerful strategies for building word of mouth and brand loyalty. Perhaps the most crucial part of retaining digital customers is handling their personal data in a way that creates trust over the long term.

- **Adjusting strategy to prepare for a new wave of competition.** The Internet will intensify competition, and new winners are likely to emerge in a variety of industries. Larger incumbents, including state-owned enterprises, will have to adjust to the challenges that can arise from innovative newcomers or risk being caught flat-footed. Competition can now emerge rapidly from unexpected corners as barriers between sectors become blurred. Frequent testing and fine-tuning of the customer experience is critical, but teams must quickly zero in on the digital investments that create the most value. Business owners and CEOs will have to be deeply engaged as they undertake decisions

19 Pyramid Research, September 2013; *Broadband China*, State Council of China, August 2013.

that can radically affect how their companies do business. Up-front investment may worsen the cost structure in the short term, but winners can reap the benefits for years to come.

- **Transforming operations.** The Internet is forcing companies across all industries to rethink their operations and abandon old ways of doing business. Manufacturing operations need to become more flexible in order to respond to fast-changing markets. Messages and offerings have to be carefully tailored to be compelling on both online and mobile platforms. Incorporating big data can be a daunting proposition, but doing so can lead to better decision making and allocation of resources as well as customer insights. Technology investments and product portfolios may have to be revisited more frequently, and CIOs may need to have a greater voice in strategy.

- **Acquiring the right capabilities and determining the right organizational structure.** Companies will face increasing talent shortages, particularly for highly specialized roles using big data and advanced analytics. Larger firms may make targeted acquisitions of small tech firms to jumpstart their digital transformations. Companies may also need to develop their own talent pipelines through training for existing employees, industry collaboration, partnerships with education providers, or public-private efforts to design external training programs. The next step is to consider how to integrate digital roles into existing operations. In some successful cases, CEOs themselves have assumed the role of "digital champion." Companies may need to change their traditional function-based organizational structures to become more customer-centric.

- **Becoming more open to partnerships and outside collaboration.** Technology is increasingly challenging the old business model of keeping major value chain activities fully in-house. In certain segments, such as the mobile market, there is already a broader ecosystem of hardware and software developers, app developers, content providers, and makers of add-on products. To establish standards and build the broader market for the Internet of Things, AT&T, Cisco, General Electric, IBM, and Intel formed the Industrial Internet Consortium. Fully developing telemedicine and precision farming may require a similar level of cooperation among companies from different sectors.

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With some 632 million users, China is already the world's largest Internet market. But its economy is on the cusp of an even greater wave of transformation as Chinese businesses go digital. Previous MGI research has found that a country's Internet maturity correlates with a sizable increase in real per capita GDP—so in other words, this shift can deliver growth and productivity gains that support higher living standards. The Internet may bring disruptive change, but companies that successfully compete at the forefront of innovation stand to create enormous value.

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